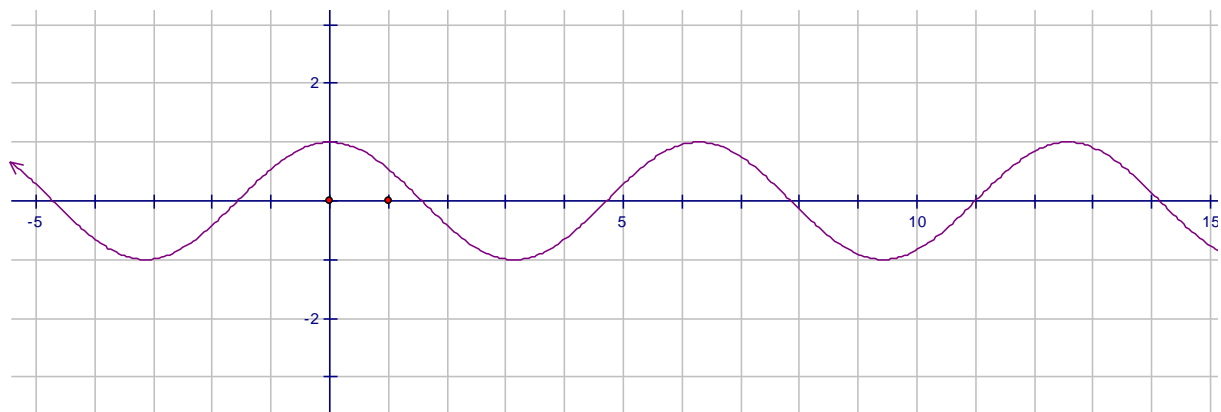


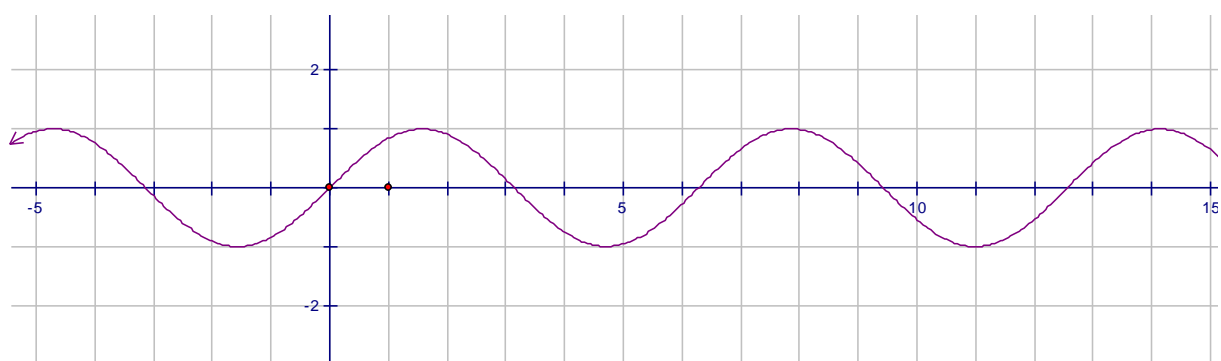
The Sine and Cosine Functions

The anatomy of a sinusoidal curve
Transformations of sinusoidal curves

$$f(\theta) = \cos \theta$$



$$f(\theta) = \sin \theta$$



Exploring Transformations:

Use Geometer's Sketchpad to explore the affects of **a**, **b**, and **d** on the graphs of sine and cosine:

$$f(\theta) = a \cos(b\theta) + d \quad \text{and} \quad f(\theta) = a \sin(b\theta) + d$$

Setup:

1. Open a new Sketch on GSP and change Preferences(Edit menu) to Radian measure for angles.
2. Define the Coordinate System. (Graph menu)
3. Define parameters a, b, and d. (Graph menu) Initially, set $a=1$, $b=1$, and $d=0$
4. Plot a new Function (graph menu). The new function will be $f(\theta) = a \cos(b\theta) + d$, but you must use "x" for the input instead of theta.

$$f(\theta) = a \cos(b\theta) + d \quad \text{and} \quad f(\theta) = a \sin(b\theta) + d$$

Explore:

1. Play with the value of the parameter a . Make sure you sample fractional values of a and negative values of a . Check that your observations are valid for **both** the sine and cosine curve.

Question: What affect does a have on the sinusoidal curve? Be specific. Is this affect consistent with other functions and transformations we have studied?

2. Reset a to 1. Play with the value of the parameter d .

Question: What affect does d have on the sinusoidal curve? Be specific. Is this affect consistent with other functions and transformations we have studied?

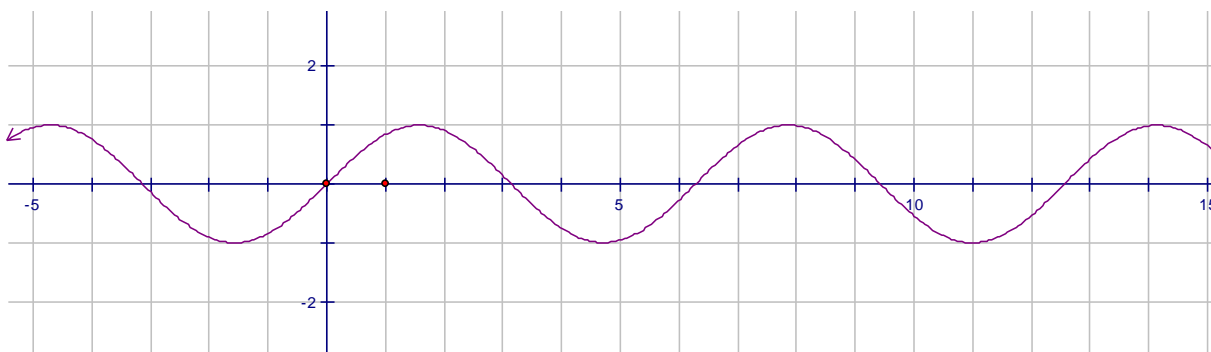
3. Reset d to 0. Play with the value of the parameter b .

Question: What affect does b have on the sinusoidal curve? Be specific. Is this affect consistent with other functions and transformations we have studied?

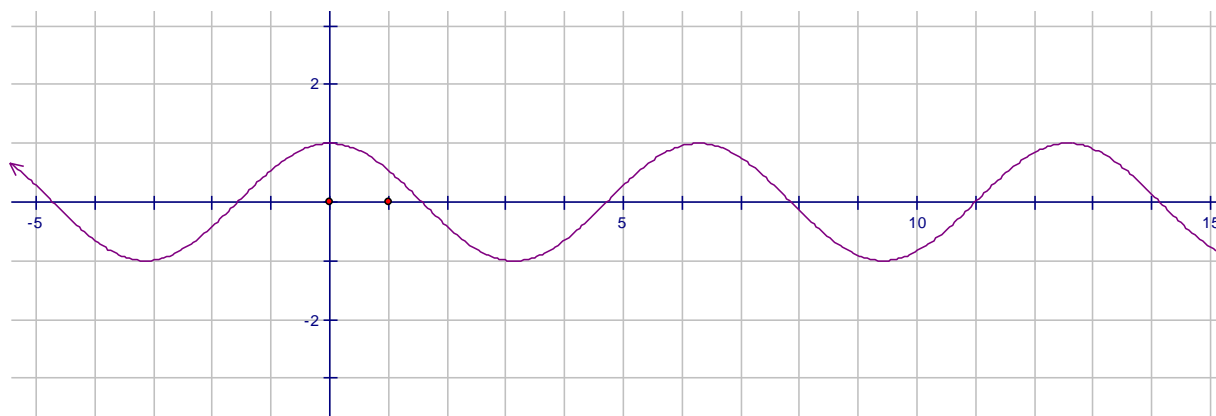
Confirm your results:

4. Based on your observations, sketch the following graphs (by hand), and then check the results using GSP.

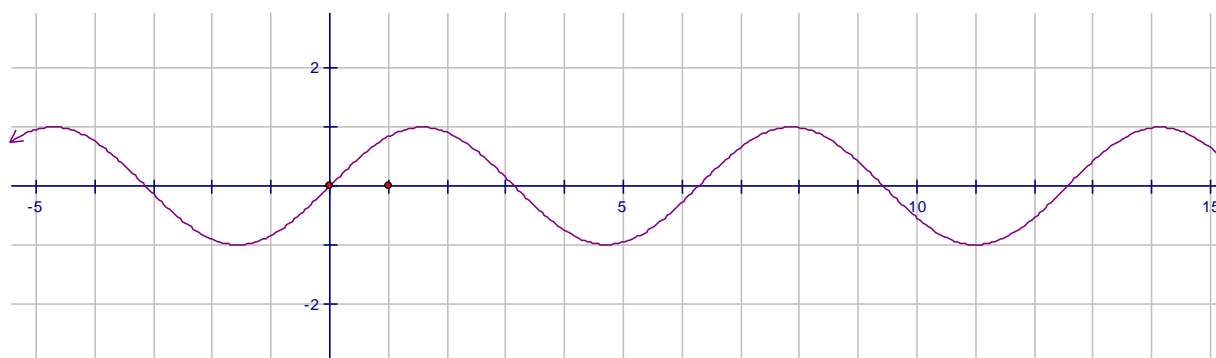
$$f(\theta) = 3 \sin \theta$$



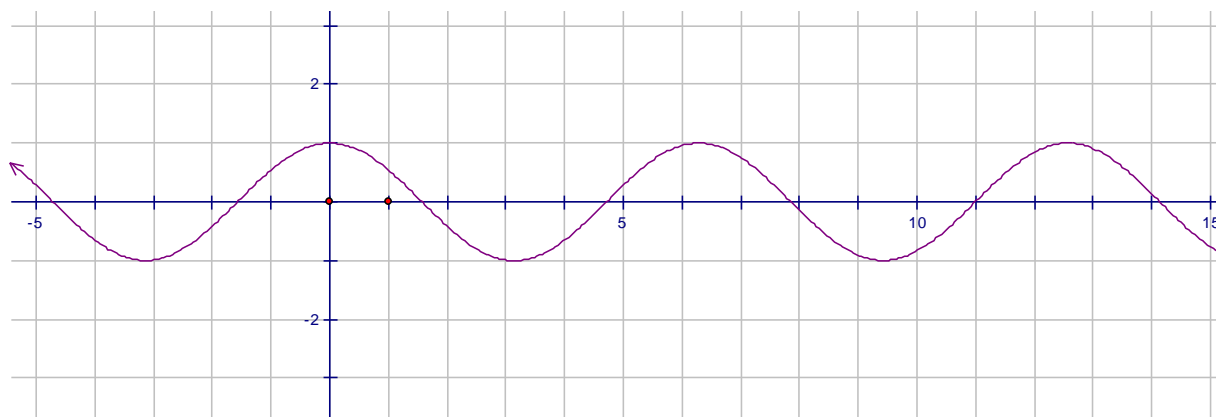
$$f(\theta) = 2\cos\theta - 3$$



$$f(\theta) = \sin(2\theta)$$



$$f(\theta) = \frac{1}{2}\cos\left(\frac{1}{2}\theta\right)$$



$$f(\theta) = -3\sin(3\theta) + 1$$

